IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

AUTOMATICALLY ERECTABLE DECORATIVE TREE

BACKGROUND OF THE INVENTION

1. Field of the Invention

[0001] This invention relates to artificial trees and, more particularly, to an automatically erectable, decorative Christmas tree that is shipped and stored in a relatively flat configuration and is quickly and easily expanded by an electric motor into an erect configuration. The subject tree can also be pre-lighted and pre-decorated.

2. Description of Related Art

[0002] Many different types of artificial decorative trees are disclosed in the prior art. Some are supported by a center pole that is either segmented or telescoping so as to be collapsible. Some have branches that plug into sockets disposed on collars attached to the center pole. Some have vertically spaced rings in graduated diameters that are supported from the top with tethers or stringers to maintain desired spacing. Some have simulated branches made in a spiral configuration. Some have branches or sub-branches that are loosely pivotally-connected to support members. Some are pre-lighted or otherwise decorated. Such prior-art trees are disclosed, for example, in United States Patent Nos. 3,677,867; 4,748,058; 4,968,541; 5,106,661; 5,413,825; 6,132,063; 6,379,021; and 6,458,435. U.S. 6,247,991 discloses an electrically powered, dynamic, collapsible and revolving toy tree.

[0003] Notwithstanding the many and various types of artificial trees previously disclosed, a decorative tree is needed that can be shipped and stored in a

relatively flat configuration, and then automatically erected to almost full height within a very short period with little effort by the user.

SUMMARY OF THE INVENTION

[0004] An artificial tree is disclosed that has a base, a telescoping center pole, and a plurality of radially extending branches that are pivotally connected to a vertical array of curvilinear elements of graduated diameter, which curvilinear elements are supported from the top of the telescoping center pole. The curvilinear elements can take the form of a plurality of discrete, vertically spaced, single or double rings, or a spiral frame extending continuously downward from the top of the telescoping center pole to a point at or slightly above the base. The diameter of the curvilinear elements, defined herein as twice the radial distance between any point on a curvilinear element and the center pole, plus the diameter of the center pole at that height, desirably decreases at increasing heights above the base to promote a generally conical, Christmas-tree-like appearance. The lengths of the pivotally connected branches also desirably decreases at increasing heights above the base of the erected tree.

[0005] The subject tree will ship and store with branches attached in a box having a relatively flat configuration, preferably 20 inches or less in height for a six to eight foot tree. Upon removal from the box at the use site, the tree can be quickly and easily expanded to its full telescoping height by plugging a power cord into a conventional wall outlet and operating a single switch to activate the electrical drive mechanism for the center pole. Optionally, the tree can be made with a single top section that is connectable to the top of the telescoping center pole. The subject tree can also be pre-lighted and pre-decorated if desired. Additionally, a novel, automatically telescoping support structure is disclosed that can have applications other than for use with decorative trees.

BRIEF DESCRIPTION OF THE DRAWINGS

[0006] The apparatus of the invention is further described and explained in relation to the following drawings, wherein:

FIG. 1 is a simplified front perspective view of one preferred embodiment of a pre-lighted, auto-erecting decorative tree of the invention in its fully expanded configuration;

FIG. 2 is a further-simplified front perspective view of the tree of FIG. 1 in a collapsed configuration;

FIG. 3 is a simplified detail view of a single pre-lighted branch for use with the tree of FIGS. 1 and 2;

FIG. 4 is a simplified front perspective view of another preferred embodiment of the auto-erecting decorative tree of the invention in its fully expanded configuration;

FIG. 5 is a simplified front perspective view of a preferred base, collapsed center pole and control box suitable for use in the auto-erecting trees of the invention;

FIG. 6 is a further-simplified front perspective view of the base and center pole of FIG. 5, with the center pole expanded to its erect position;

FIG. 7 is a detailed, cross-sectional, front elevation view taken along Line 7—7 of FIG. 5;

FIG. 8 is a detailed, cross-sectional, front elevation view taken along Line 8—8 of FIG. 6;

FIG. 9 is a simplified, front-elevation view of another preferred embodiment of the auto-erecting decorative tree of the invention in its fully expanded configuration;

FIG. 10 is a front perspective view of a preferred spiral frame for the tree of FIG. 9 as shown in a collapsed position;

FIG. 11 is an enlarged, detail view taken from FIG. 10; and

FIG. 12 is an enlarged, exploded detail view of a pivotable hinge-and-branch assembly suitable for use with the spiral frame as shown in FIGS. 10 and 11.

DESCRIPTION OF THE PREFERRED EMBODIMENTS

[0007] One preferred embodiment of automatically erectable tree 10 of the invention is further described in relation to FIGS. 1-3. It should be understood that the branch structure and other features of tree 10 are simplified for illustrative purposes, so that the basic structure and features can be more easily seen and explained. Therefore, it will be appreciated that the individual branches of tree 10 will have many more sub-branches than shown, giving the resultant tree a much more natural appearance. Similarly, only two branches 30 are depicted as being attached to inner ring 24 of each ring assembly 20, whereas in a commercial product each ring assembly will have more than two pivotally connected branches 30 that are circumferentially spaced around tree 10.

[0008] Referring to FIGS. 1-3, tree 10 preferably comprises base 12, telescoping center pole 14, and tree top section 16. Tree top section 16 is desirably prefabricated with the branches attached and is connectable to the top of center pole 14 either before or after center pole 14 is elevated to its fully erect configuration. As shown in FIG. 2, one structure suitable for use in connecting tree top section 16 to the top of center pole 14 is projection 56 that is insertable into frictional engagement with a cooperating recess in cross-braces 36 that are used to mount support ring assembly 34 on top of center pole 14. Referring to FIG. 1, a plurality of vertically spaced ring assemblies of graduated diameter are suspended from support ring assembly 34 in spaced apart relation that is determined by flexible tethers 28. Although only two tethers 28 are visible in FIGS. 1 and 2, it will be appreciated that one tether 28 is hidden behind center pole 14 and the use of three or more circumferentially spaced tethers 28 is preferred to maintain the desired spacing and alignment between ring assemblies 20. Desirably, branches 30 will have sufficient fullness that ring assemblies 20, tethers 28 and center pole 14 are not readily visible when the tree is erected to its full height.

[0009] Each ring assembly 20 preferably further comprises two concentric rings with a plurality of circumferentially spaced, radially extending spokes 26 connecting outer ring 22 and inner ring 24 in fixed positional relation to each other. Each branch preferably comprises one end 32 that is pivotally connected to inner ring 24 in such manner that branch 30 can rotate slightly upward when center pole 14 is

collapsed to the position shown in FIG. 2. The range of permitted upward rotation around inner ring 24 should be sufficient to accommodate nesting with interfering lower branches 30 as center pole 14 is lowered to the collapsed configuration. When center pole 14 is in the fully erect position as shown in FIG. 1, each pivotally connected branch 30 rests on and is supported by outer ring 22, which limits the range that each branch 30 can pivot downwardly around inner ring 24. Tethers 28 are preferably tied off on each outer ring 22 to maintain the desired vertical spacing between ring assemblies 20 supported beneath top support ring assembly 34.

[0010] Referring to FIG. 1, tree 10 is preferably pre-lighted, as represented by light wiring harness 48 that extends upwardly from control panel 40, around center pole 14 and down each branch 30. Plug 52 is desirably provided at the top of center pole 14 to permit the attachment of light wiring 54 attached to top tree section 16. Alternatively, in place of wiring 54, it will be appreciated that an additional length of light wiring can be provided at the top end of wiring harness 48 for use in lighting top tree section 16 after it is attached to center pole 14. The power supply to wiring harness 48 and through wiring 46 to motor 44 that is used to selectively raise and lower telescoping center pole 14 is received through power cord 42 connectable to a conventional wall outlet. Control panel 40 preferably comprises a step-down transformer and switches 50 that are operated by the user to selectively control the lighting and the raising or lowering of center pole 14. Wiring harness 48 and wiring 54 used to light tree 10 can comprise any of the many well known, commercially available types of lighting such as, for example, rope lights, mini-lights, fiber optic lights, or the like. FIG. 3 is an enlarged detail view depicting a single branch 30 pivotally connected to one of two ring assemblies 20 that are constructed and joined by flexible tethers 28 as described above. Branch 30 depicts in simplified form additional "feathering" 64 that can be attached to sub-branches 56 to provide a fuller, more bushy look, and also depicts the use of a decorative light string 60 comprising a plurality of mini-light bulb and socket assemblies 62.

[0011] Another preferred embodiment of the invention is disclosed in simplified form in relation to FIG. 4, wherein tree 70 comprises base 72, telescoping center pole 74, and a plurality of vertically spaced and separated rings 76 supported by

circumferentially spaced tethers 86 from top support ring 82 affixed to the top of telescoping center pole 74 by cross-braces 88. Tree top section 90 is desirably connectable to telescoping center pole 74 above top support ring 82. A plurality of circumferentially spaced branches 78 are pivotally connected to each ring 76, and the downward rotation of each branch 78 relative to its respective ring 76 is limited by at least one flexible tether 84. In the embodiment shown in FIG. 4, tethers 84 are suspended from branches connected in fixed relation to top support ring 82, although other similarly effective points of attachment can also be used. As with the embodiment previously described in relation to FIGS. 1-3, electrical power is desirably supplied to motor 96 in base 72 through power cords 94, 98 and control panel 92. Tree 70 can also be pre-lighted as previously described, although the wiring harness connected to lighting power cord 100 is not shown in FIG. 4 for ease of illustration.

[0012] Although the preferred embodiments of the invention described in relation to FIG. 1-4 utilize a top tree section disposed above the support ring assembly attached to the top of the telescoping center pole, it will be appreciated that the need for a top tree section can be eliminated by further increasing the number of ring assemblies and by gradually reducing the diameter of the vertically spaced rings and top support ring to a point where the top support ring can satisfactorily serve as the apex of the tree. In such case, it may also be desirable to increase the number of telescoping sections in the center pole. When no tree top section is required, the entire artificial tree becomes automatically erectable simply by plugging the power cord into a wall outlet and operating a switch on the control panel.

[0013] A preferred construction for a base and telescoping center pole suitable for use in the automatically erectable, artificial trees of the invention is further described and explained in relation to FIGS. 5-8. Referring to FIG. 5, tree stand 110 desirably comprises base 112 and telescoping center pole 114. A drive mechanism disposed inside base 112 and center pole 114 is powered by electric motor 120, which preferably receives power through power cords 118 and 122, and is user-controlled by means of switches disposed in control panel 116. In FIG. 5, telescoping center pole 114 is collapsed into its storage position, whereas in FIG. 6, tubular lower section 124, middle section 126 and upper section 128 are fully extended, as indicated by taut

tension lines 132. Orifice 130, which can be threaded, is desirably provided in the top of upper section 128 to facilitate the attachment of a support ring assembly and tree top section (not shown).

[0014] The internal structure and operation of tree stand 110 are more particularly described and explained in relation to FIGS. 7 and 8. Base 112 comprises a shaft-support member 140 containing an elongate, rotatable shaft 146 having a threaded upper portion. The lower end of shaft 146 is connected to a horizontal pulley 142 that is rotated by belt 144 driven by a cooperating drive pulley attached to the output shaft of electric motor 120. The bottom end of tubular lower section 124 of telescoping center pole 114 is desirably connected in fixed relation to base 112. Middle section 126 has a generally cylindrical sidewall with a diameter slightly less than that of lower section 124 so that middle section 126 can rest in sliding engagement inside lower section while in the collapsed position. The lower end of middle section 126 preferably comprises a bottom 150 that further comprises a threaded nut 148 having threads that cooperatively engage the threaded upper portion of shaft 146. With this arrangement, the rotation of shaft 146 by motor 120 in one direction will cause middle section 126 to "climb" upwardly on shaft 146, causing its top end to rise progressively upward out of lower section 124. It will also be appreciated that other similarly effective drive mechanisms such as worm gears can be used to rotate shaft 146 using motor 120 if desired.

[0015] The upward travel of middle section 126 relative to lower section 124 is limited by the length of shaft 146, which will desirably comprise a transversely extending pin, nut, or other readily available, similarly effective obstruction (not shown) at a desired height near its upper end to prevent middle section 126 from either rotating off the end of shaft 146 or from traveling so far out of lower section 124 that it can no longer provide stable support for upper section 128. Any such obstruction must, however, be such that upper section 128 can slide upwardly over shaft 146 as middle section 126 moves up the shaft. Alternatively, the outside wall of middle section 126 can be provided with a vertical keyway that extends from its top to a point near its bottom, and lower section 124 can be provided with an inwardly facing projection that travels along the vertical keyway as middle section 126 rises relative to lower section

124. Further upward movement of middle section 126 inside lower section 124 will then be stopped when a shoulder at the lower end of the vertical keyway contacts the inwardly facing projection. Generally cylindrical upper section 128 desirably slidably engages both shaft 146 and the inside of middle section 126.

[0016] Upper section 128 of telescoping center pole 114 desirably moves upward relative to middle section 126 as middle section 126 simultaneously rises inside lower section 124. According to a preferred embodiment of the invention, upper section 128 is drawn upwardly by tension exerted along tension lines 132 as middle section 126 rises inside lower section 124. Tension lines 132 are preferably pinned to lower section 124 at a plurality of circumferentially spaced connection points 134 and to lower end 137 of upper section 128 at circumferentially space connection points 152. At least two diametrically opposed tension lines 132 are needed, with three or four evenly spaced lines being most preferred. The upward range of travel of upper section 128 is limited by the length of tension lines 132, but is also desirably limited by annular outside shoulder 136 (visible in FIG. 7) on lower end 137 of upper section 128 that abuts inwardly projecting guide member 138 near the top of middle section 126 to prevent the rupture of tension lines 132. Guide member 138 is desirably shaped and constructed so as to reduce the likelihood of fraying or cutting of tension lines 132. If desired, motor 120 can also be provided with an automatic shut-off that is activated whenever the torque loading on shaft 146 exceeds a predetermined value that is reached whenever telescoping center pole 114 reaches its fully expanded or fully collapsed position. Although this structure is disclosed herein for use in connection with the preferred application as a tree stand 110 for an automatically erectable decorative tree, it should be understood that there can likewise be many other applications for this auto-erecting support structure.

[0017] Still another embodiment of the invention is described and explained in relation to FIGS. 9-12, which depict an automatically erectable tree 160 that does not embody either discrete, vertically separated rings or, necessarily, a top tree section. Referring to FIG. 9, tree 160 preferably comprises base 162, telescoping center pole 164, and spiral frame 166 that is attachable to top 168 of center pole 164 and to bottom connector ring 170 of base 162. Drive motor 176 is also provided in base

162 and is connected by power cord 178 to control panel 172 having a plurality of switches that can be used to selectively raise and lower telescoping center pole 164 when main power supply cord 174 is connected to a conventional electrical outlet. Another power cord 180 is optionally provided where tree 160 is pre-lighted as previously discussed in relation to other embodiments of the invention. In FIG. 9, the major portion of spiral frame 166 is broken away to simplify the drawing, but the entire spiral frame is depicted in a collapsed configuration in FIG. 10.

[0018] Referring to FIGS. 10 and 11, spiral frame 166 preferably further comprises an elongate, coiled hollow body portion 182 having a connector tab 188 disposed at one end for attachment to bottom connector ring 170 of FIG. 9, and molded top end portion 184 and top connector hub 186 disposed at the other end for attachment to the top of telescoping center pole 164 of FIG. 9. A plurality of branch attachment sockets 190 are spaced apart along the curvilinear length of hollow body portion 182 for use in pivotally attaching branch connector members 192. Fig. 12 is an illustrative, exploded detail view showing a portion of a curvilinear element of hollow body 182, branch connector member 192 and branch 198 as they would be aligned for assembly during the manufacture of tree 160 of FIG. 9. Hinge end 194 of branch connector member 192 desirably snaps into pivotal engagement with branch attachment socket 190, and cylindrical socket 196 of branch connector member 192 is configured to receive branch 198 in frictional sliding engagement so that branch 198 is thereafter pivotally connected to hollow body 182. The configuration of branch attachment sockets 190 and of branch connector members 192 cooperate to permit branch 198 to rotate slightly upward relative to hollow body 182 during nesting of the branches that occurs when center pole of tree 160 is collapsed. The shapes of branch connector members 192 and hollow body 182 also cooperate to limit the downward range of travel of branch 198 relative to hollow body 182 during normal use when tree 160 is fully erect. As with other embodiments of the invention discussed above, feathered or tufted sub-branches 200 can be provided to give tree 160 a more full appearance, and electrical conductors 202 with lighting elements 204 can be pre-attached for minimizing set-up effort required of the user.

[0019] Materials used for constructing the artificial trees of the invention can vary, and will typically include both metallic and polymeric materials, depending upon the particular element and its intended use. The materials of construction are desirably sufficiently durable to permit repeated use but not so expensive as to make the resultant trees unaffordable for widespread use by a variety of consumers.

[0020] It should be understood that the apparatus of the invention is not limited to the preferred drive mechanism described herein for selectively raising and lowering the center pole, and any other similarly suitable drive mechanism can likewise be used. Thus, for example, drive mechanisms utilizing gears or other means can be substituted for combination screw drive/ tensioning line system disclosed above. Also, it will be apparent upon reading the disclosure that the automatically erectable trees disclosed herein can be pre-decorated with garland, bows, ornaments, or the like, in addition to lights if desired. Furthermore, it will be appreciated that the ring assemblies, rings, spiral frames, top support rings, and branches of the subject trees can themselves be wrapped in or covered with materials that will better simulate natural trees if desired.

[0021] Other alterations and modifications of the invention will likewise become apparent to those of ordinary skill in the art upon reading this specification in view of the accompanying drawings, and it is intended that the scope of the invention disclosed herein be limited only by the broadest interpretation of the appended claims to which the inventors are legally entitled.